



The association between childhood physical disability or long-term health problems and depression among adolescents in China: Mediating effect of childhood maltreatment

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ABSTRACT

Background: Increasing evidence has suggested that childhood maltreatment might mediate the association between physical disability or chronic illness and depression among adolescents. We sought to identify whether childhood maltreatment mediated the relationship between physical disability or long-term health problems and depression in Chinese adolescents.

Method: A total of 5726 middle and high school students aged 12–18 years old were chosen to participant in this study. Participants completed the self-reported questionnaire on childhood physical or long-term health problems, childhood maltreatment and depression.

Results: The results showed that there were significant differences of childhood maltreatment, depression between adolescents with childhood physical disability or long-term health problems and those without. Physical abuse, sexual abuse, emotional abuse, physical neglect and emotional neglect mediated the association between childhood physical disability or long-term health problems and depression accounting for 8.7%, 20.6%, 14.5%, 16.3% and 14.7% of the total effect of physical disability or long-term health problems on depression in each single mediator model respectively, whereas the indirect effect of emotional abuse and sexual abuse in the association between physical disability or long-term health problems and depression explained 15.6% and 8.0% of the total effect in a multiple mediation model respectively.

Conclusion: Childhood physical disability or long-term health problems was associated with the increased risk for depression, and the associations between childhood physical disability and long-term health problems and depression were partially mediated by childhood maltreatment experiences. Childhood maltreatment exposure should be considered to prevent depression among adolescents with childhood physical disability or long-term health problems.

1. Introduction

The China Disabled Person's Federation estimates that there are 3.87 million children aged 0–14 years old with physical, listening, hearing and speech, visual, intellectual and mental disability in 2006. Further, there are 2.46 million school-age disabled children aged between 6 and 14 years old. Among them, 63.19% of school-age disabled children are receiving compulsory education in ordinary education or special education schools (The China Disabled Person's Federation,

2007). Previous studies suggest that children and adolescents with physical disabilities, long-term health problems, or chronic illnesses make them at the increased risk for mental health problems, including depression (Arabi et al., 2013; Benton et al., 2007; Deschênes et al., 2015; Kostev et al., 2019).

Individuals with disabilities had greater probabilities of experiencing childhood maltreatment than those without disabilities. Particularly, childhood sexual abuse was the most frequently reported type of adverse childhood experiences (Austin et al., 2016). Sullivan

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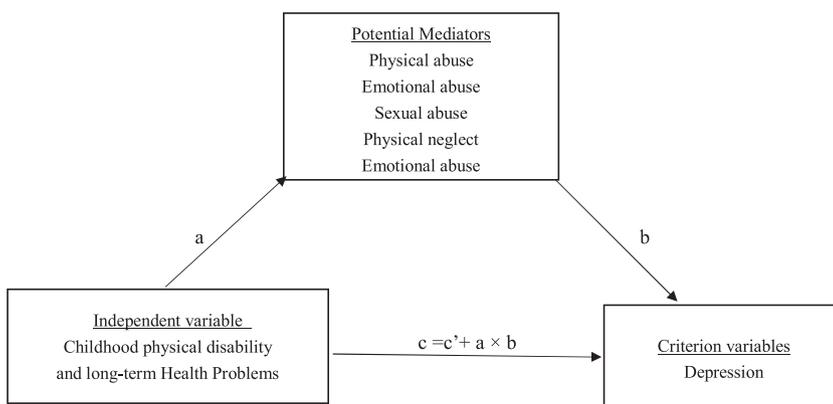
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and Knutson reported that children with disabilities were 3.4 times more likely to be maltreated than nondisabled peers (Sullivan and Knutson, 2000). Jones et al. (2012) conducted a systematic review of studies that focused on maltreatment and disabilities and found that children with disabilities are more likely to be victims of maltreatment than are their peers who are not disabled.

Child maltreatment can increase the risk for poor physical and mental health outcomes later in life, including depression (Davies et al., 2018; Luby et al., 2017; Thompson et al., 2015). Both cross-sectional and longitudinal studies have confirmed a positive relationship between childhood abuse and neglect and depression in adolescence (Hovens et al., 2016; Luby et al., 2017; McLaughlin et al., 2012; Widom et al., 2007). For example, child maltreatment was associated with an increased risk for current major depression disorders in young adulthood. Children who were physically abused or experienced multiple types of abuse were at the increased risk of lifetime major depression disorders, whereas neglect increased the risk for current major depression disorders (Widom et al., 2007). Further, studies in children and adolescents with disability or chronic illness have found that childhood maltreatment was correlated with depression (Berg et al., 2015; McFarland et al., 2017).

China is a developing country and shares a different cultural value from Western countries. Under the influence of Confucianism, Chinese culture emphasizes parental authority and children's obedience toward their parents. Physical punishment was considered as a way of displaying parental love and care to children rather than child maltreatment in China (Peng et al., 2015). Further, China has kept economic reforms since the late 1970s and has witnessed soaring economic growth in the past years. However, the rapid social transformation of China can have impact on the problem of child maltreatment and depression. Socioeconomic change has been proposed as a contributing factor to child maltreatment in China (Liao et al., 2011; Peng et al., 2015). Further, social cultural changes might be one of the reasons for the increase in the prevalence of depression in children and adolescents (Bernaras et al., 2019). Due to its different cultural backgrounds and the rapid social transformation of China, we aimed to explore the association between childhood disability or long-term health problems and depression and the role of childhood maltreatment in this association in China.

Based on previous findings, it is hypothesized that childhood maltreatment might mediate the association between physical disability or chronic illness and depression in Chinese adolescents (see Fig. 1). The objectives of this study were (i) to assess the prevalence rate of childhood physical disability or long-term health problems, (ii) to explore the effect of childhood physical disability or long-term health problems on depression, and (iii) to identify whether childhood maltreatment mediated the effect of physical disability or long-term health problems on depression.



2. Methods

2.1. Study design and participants

This study was a part of the research project “Adolescent Health and Risky Behaviors in Anhui Province”. Anhui province is located in the middle of China and its economic development ranks the medium level in China. The study protocol has been described in previous studies (Han et al., 2018; Wang et al., 2019). Briefly, a 3-stage, random, cluster sampling approach was employed to select participants in Anhui province. Adolescents aged 12–18 years old were selected from 48 classes of six grades (i.e., 7th to 12th grade) of three regular middle and three high schools in three cities (i.e., Tongling, Chuzhou, and Fuyang) of Anhui province. Tongling, Chuzhou, and Fuyang are located in the south, the middle and the north in Anhui, respectively. In the sampling process, eight classes were randomly selected from each grade of those schools, and one regular middle and high school were randomly chosen from each of those three cities.

Cluster sampling resulted in a sample of 6032 students aged 12–18 years old. Of these students, 205 refused to participate in the study and 67 were absent from school at the time of the survey. Thus, the questionnaire was completed by 5760 (95.5%) students. Due to the incompleteness of the questionnaires, 34 students were excluded from analyses. Finally, we obtained an effective sample of 5726 students, including 2848 males (49.7%) and 2878 females (50.3%). The students were aged from 12 to 18 years, and the mean age was 14.81 years.

2.2. Procedure

All of the students in the selected classes were invited to participate voluntarily in this study. Students who were absent from class were excluded from the study. Trained interviewers administered anonymous questionnaires in the absence of teachers to avoid any potential information bias. Each student sat at a separate table. All data were collected in December 2013.

2.3. Ethical approval

The study received the approval from the Biomedicine Ethical Committee of Anhui Medical University. All of the participants were fully informed about the purpose of this investigation and were invited to participate voluntarily. Additionally, written informed consents were obtained from the targeted schools, each participating student and one of their parents.

2.4. Measurements

2.4.1. Childhood physical disability or long-term health problems

The item used to examine the prevalence rate of a physical disability

Fig. 1. Hypothetical model. a: effect of childhood physical disability and long-term health problems on childhood maltreatment (potential mediators); b, effect of potential mediators on depression; c, total effect of childhood physical disability and long-term health problems on depression; c', direct effect of childhood physical disability and long-term health problems on depression; a × b, indirect effect, the effect of childhood physical disability and long-term health problems on depression through childhood maltreatment (potential mediators).

Table 1
Sample characteristics.

Variable	n (%)	Mean ± SD
Gender		
Male	2,848 (49.7)	
Female	2,878 (50.3)	
Grade		
Middle	2,958 (51.7)	
High	2,768 (48.3)	
Only child		
Yes	2469 (43.1)	
No	3257 (56.9)	
Family structure		
Nuclear family	3792 (66.2)	
Single-parent family	1353 (23.6)	
Large family	469 (8.2)	
Others	112 (2.0)	
Family economic status		
Good	549 (9.6)	
General	4,377 (76.4)	
Bad	800 (14.0)	
Relationship with mother		
Good	1 353 (23.6)	
Poor	4 373 (76.4)	
Relationship with father		
Good	1 911 (33.3)	
Poor	3 815 (66.7)	
No. of friends		
< 3	1,439 (25.1)	
≥ 3	4,287 (74.9)	
Childhood physical disability and long-term Health Problems		
No	5283 (92.3)	
Yes	443 (7.7)	
Childhood maltreatment		
Physical abuse	6.22 (2.26)	
Emotional abuse	5.62 (1.82)	
Sexual abuse	5.27 (1.29)	
Physical neglect	5.55 (1.84)	
Emotional neglect	5.51 (1.61)	
Overall CTQ scores	28.18 (7.00)	
SDS scores	42.52 (7.56)	

or long-term health problems was adopted from previous study (Everett Jones and Lollar, 2008). Participants were asked one question: “Do you have any physical disabilities or long-term health problems in childhood?”. The response options were as follows: yes, no, and not sure. At first, a standard definition of physical disability and long-term health problems was given. Physical disability was defined as a loss of motor function of varying degrees or limitations in movements or activities resulting from deformed limbs or body paralysis (palsy) or from deformity caused by damaging to the structure or function of those body parts involved in mobility (Zheng et al., 2011). Long-term health problems refer to health problems lasting six months or more (Everett Jones and Lollar, 2008). For the purpose of statistical analysis, the response option of “No” and “Not sure” was combined into the one group (i.e., No). Before the survey, this questionnaire was retested (1-week interval) with 156 senior and junior students. The Kappa value was 0.85, which suggests that the questionnaire showed the desired reliability.

2.4.2. Childhood maltreatment

The CTQ-SF is a widely-used self-reported tool to assess childhood physical abuse, emotional abuse, sexual abuse, physical neglect, and emotional neglect (Bernstein et al., 2003). Questions regarding childhood experiences were rated on a 5-point scale with response options ranging from never to very often (1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = very often). The score for each type of maltreatment ranged from 5 to 25. The Chinese version of the questionnaire showed the acceptable reliability (internal consistency reliability coefficients ranging from 0.78 to 0.90 and test-retest reliability ranging from 0.79 to 0.88) (Zhao et al., 2005).

2.4.3. Zung's self-rating depression scale (SDS)

Zung's Self-Rating Depression Scale (SDS) was adopted in this study to evaluate depression (Zung, 1965). The SDS consists of 20 items, with a total number of points ranging from 20 to 80. The questionnaire has been revised in China (Wang and Wang XL, 1999).

2.4.4. Covariates

Socioeconomic status (SES) and family structure have been found to be associated with child maltreatment, disability and depression (Arias-De La Torre et al., 2018; Liang et al., 2012; Maclean et al., 2017; Shifrer et al., 2011; Turner et al., 2007, 2011; Viola et al., 2016). We controlled the potential influence of several sociodemographic variables, including age, gender (male or female), grade, only child (yes, no), family structure (nuclear family, single-parent family, large family, others), family socioeconomic status (good, moderate, poor), relationship with mother and father (good or poor), and number of friends (< 3 or ≥ 3).

2.5. Data analysis

Data analysis was performed by using SPSS version 22. Descriptive statistics were reported by mean ± standard deviation or proportion, as appropriate. Childhood maltreatment and depression scores between students with physical disability or long-term health problems and those without were compared by independent samples *t*-test. Pearson's Spearman's correlation analyses were used to investigate the relationships between childhood maltreatment and depression.

To determine whether childhood maltreatment mediated the associations between childhood physical disability or long-term health problems and the depression (Fig. 1), we used the indirect method recommended by Preacher and Hayes (Preacher and Hayes, 2008). The indirect method enables to estimate the total, direct, and indirect unstandardized effects of the independent variables on the dependent variables through the mediator variable, controlling for covariates (i.e., age, gender, and family status, relationship with both parents and number of friends). Physical abuse, sexual abuse, emotional abuse and neglect often overlap with each other and tend to occur together. (Kim et al., 2017; Sesar et al., 2008). To consider the effects from five forms of childhood maltreatment simultaneously, we further performed a multiple mediation model to test the significance of each form of childhood maltreatment within the model. A two-tailed $P < 0.05$ was considered statistically significant.

3. Results

3.1. Sample characteristics

The sample characteristics were shown Table 1. The prevalence rate of childhood physical disability or long-term health problems was 7.7% in this sample.

3.2. Childhood physical disability or long-term health problems and childhood maltreatment and depression

Students with physical disability or long-term health problems were

Table 2
Comparison of childhood maltreatment and depression between adolescents with childhood physical disability and long-term health conditions or without.

	Physical disability and long-term health conditions		t	P
	Yes	No		
Depression	44.57 ± 7.20	42.34 ± 7.56	6.692	< 0.001
Physical abuse	6.07 ± 2.33	5.59 ± 1.77	4.238	< 0.001
Emotional abuse	6.96 ± 2.72	6.16 ± 2.20	6.604	< 0.001
Sexual abuse	5.64 ± 2.07	5.24 ± 1.20	4.006	< 0.001
Physical neglect	6.10 ± 2.58	5.51 ± 1.75	4.752	< 0.001
Emotional neglect	6.02 ± 2.35	5.47 ± 1.53	4.876	< 0.001

more likely to report all forms of childhood maltreatment and depression, which was statistically significant (See Table 2). All forms of childhood maltreatment were positively correlated with depression (physical abuse, $r = 0.127$, $P < 0.001$; emotional abuse, $r = 0.198$, $P < 0.001$; sexual abuse, $r = 0.139$, $P < 0.001$; physical neglect, $r = 0.156$, $P < 0.001$; emotional neglect, $r = 0.171$, $P < 0.001$).

3.3. Potential mediating factors between childhood physical disability or long-term health problems and depression

We explored whether the association between childhood physical disability or long-term health problems and depression could be explained by childhood maltreatment as mediating variables. As shown in Table 3, childhood physical disability or long-term health problems are related to all forms of childhood maltreatment. Further, all forms of childhood maltreatment are correlated with depression. Each form of childhood maltreatment showed significant indirect effects ($a \times b$ effects) in regression analyses in each single mediator model. Physical abuse, sexual abuse, emotional abuse, physical neglect and emotional neglect mediated the association between childhood physical disability or long-term health problems and depression accounting for 8.7%, 20.6%, 14.5%, 16.3% and 14.7% of the total effect of physical disability or long-term health problems on depression, respectively.

In a multiple mediation model including all forms of childhood maltreatment as mediators, the indirect effects ($a \times b$ effects) remained significant for emotional abuse and sexual abuse, whereas physical abuse, emotional neglect and physical neglect did not mediate the association between childhood physical disability or long-term health

problems and depression. The indirect effect of emotional abuse and sexual abuse in the relation between physical disability or long-term health problems and depression explained 15.6% and 8.0% of the total effect, respectively. Notably, emotional abuse has a greater indirect effect than the other four forms of childhood maltreatment. To sum up, the mediation analyses suggest that there is an overall effect of childhood physical disability or long-term health problems on depression, with emotional abuse, sexual abuse, physical neglect and emotional neglect mediating the associations.

4. Discussion

The current study has demonstrated that childhood maltreatment mediates the relationship between childhood physical disability or long-term health problems and depression in this sample of 7–12 grades students. This finding highlights the negative effect of childhood physical disability or long-term health problems could extend into the adolescence period, and the potential of childhood maltreatment could be targeted as possible intervention to reduce depression in adolescents with childhood physical disability or long-term health problems.

The prevalence rate of childhood physical disability or long-term health problems was 7.7% in this study. A national representative survey in China has reported that 2.3% of 0-6-year-old male children were physical disability, and 1.7% of 0-6-year-old female children were physical disability, whereas 4.6% of 7-17-year-old male children were physical disability, and 3.6% of 7-17-year-old female children were physical disability in 2006 (Zheng et al., 2011). In Malaysian, the prevalence rate of physical disability was 2.8 per 1000 population among children aged between 7 and less than 18 years old (Khoo et al., 2009). A report from US has showed that one in 10 (10.3%) students reported physical disabilities or long-term health problems, which was slightly higher than that in our study (Everett Jones and Lollar, 2008). A possible reason is that physical disability or long-term health problems in childhood were investigated in this study. Further, a study in Changsha was reported that the prevalence rate of self-reported chronic disease in children and adolescents in Changsha was 3.79%, whereas the prevalence rate of hypertension was 19.89% and the obesity rate was 8.76% through medical examination (Huang et al., 2018). The prevalence rate varies across different studies due to the different definitions of physical disability or long-term health problems. In China, some forms of disability students might attend special education schools, thus, the prevalence rates of physical disability or long-term health problems might be underestimated in this study. Therefore, future studies should include special education schools aiming to have a

Table 3
Mediation analysis of childhood maltreatment on the relationship between childhood physical disability and long-term health conditions and depression.

Mediating variable (M)	Effect of childhood physical disability and long-term health conditions on M (a)	Effect of M on depression (b)	Indirect effect on depression ($a \times b$)	Direct effect of childhood physical disability and long-term health conditions on depression (c')	Total effect (c)
Physical abuse	0.4167**	0.4166***	0.1736	1.8244**	1.998**
Emotional abuse	0.7640**	0.5374***	0.4106	1.5874**	1.998**
Sexual abuse	0.3750**	0.7737***	0.2901	1.7079**	1.998**
Physical neglect	0.5248**	0.6205***	0.3256	1.6723**	1.998**
Emotional neglect	0.5411**	0.5427***	0.2936	1.7043**	1.998**
All mediators in a model			0.5446	1.4534**	1.998**
Physical abuse	0.4167**	-0.1246	-0.0519		
Emotional abuse	0.7640**	0.4069***	0.3109		
Sexual abuse	0.3750**	0.4260***	0.1598		
Physical neglect	0.5248**	0.1867	0.0980		
Emotional neglect	0.5411**	0.0516	0.0279		

Note: Indirect effects were considered to be significant (indicated in bold).

a, effect of IV on M; b, effect of M on DV; $a \times b$, indirect effect; c, total effect; c' direct effect; DV, dependent variable; IV, independent variable; M, mediating variable.

* $P < 0.05$.

** $P < 0.01$.

*** $P < 0.001$.

full understanding of prevalence rates of physical disability or long-term health problems in China.

We found that childhood physical disability or long-term health problems was associated with the increased risk for depression. Consistently, previous studies have found that physical disability, long-term health problems or chronic illness was associated with mental health problems among children, including depression (Arabiati et al., 2013; Benton et al., 2007). On the one hand, our results extended previous findings that physical disability or long-term health problems in childhood have a long-lasting negative effect on depression in adolescence. A recent review has emphasized that the persistence of poor childhood health throughout life and early childhood physical health problems have negative effects on later-life health outcomes (Delaney and Smith, 2012). On the other hand, this finding informs us that the mental health of children with physical disability or long-term health problems need to be brought to the forefront.

Students reported physical disability or long-term health problems were likely to be ill-treated. The association between physical disability and maltreatment has been documented in the literature (Chan et al., 2014; Sullivan, 2009). Specifically, students with physical disability or long-term health problems were more likely to report each form of childhood abuse, as well as childhood neglect. Recent research has begun to focus on the impact of different types of disabilities. For example, children with intellectual disability, mental/behavioral problems, and conduct disorder continued to have increased risk of an maltreatment allegation and substantiated maltreatment allegation after adjusting child, family, and neighborhood risk factors (Maclean et al., 2017). However, the specific forms of physical disability or long-term health problems were not addressed in this study. To fully understand the relationship between disabilities and mental health, future studies, especially those examining the specific type of physical disability or long-term health problems, are needed.

Experiencing early adversity such as childhood abuse and/or neglect is considered as a general risk factor for poorer children and adolescent health outcomes. Both cross-sectional and longitudinal studies have confirmed the relationship between childhood maltreatment and depression among adolescence (McLaughlin et al., 2012; Thompson et al., 2015; Widom et al., 2007). In a sample of school girls in Iranian, neglect and discrimination at home was associated with increased risk for depression (Fakhari et al., 2012). Notably, Usami et al. (2019) found that the traumatic symptoms of kindergarteners who survived the Great East Japan Earthquake and tsunami were not associated with disaster experiences, whereas these traumatic symptoms may have been correlated to the mental state of their parents and to their living environment, such as child maltreatment after the tremendous disaster. This finding further supports that child maltreatment could exert a negative effect on mental health of children. In this study, our results further confirmed the positive association between childhood maltreatment and depression in adolescents with childhood physical disabilities and long-term health problems.

This study investigates the possible mediating role of childhood maltreatment in the association between childhood physical disability or long-term health problems and depression among adolescence. All forms of childhood maltreatment mediated the effect of childhood physical disability or long-term health problems on depression in each single mediator model. As such, childhood maltreatment exposure should be considered to reduce depression in adolescents with childhood physical disability and long-term health problems. One of possible underlying reasons for this finding may be higher stress level experienced by their parents. Parenting stress and anger expression were positively correlated with child abuse potential (Rodriguez and Green, 1997; Svensson et al., 2013). Sarah Miragoli et al. (2018) found that parenting distress partially mediated the association between parents' perception of child behavior and child abuse potential. Further, in a multiple mediation model including all forms of childhood maltreatment as mediators, emotional abuse has a greater indirect effect than

the other four forms of childhood maltreatment. This finding suggests that to prevent depression in adolescents with physical disability and long-term health problems, more attention is needed to be paid to adolescents who experienced emotional abuse.

We believe our findings have important practice implications. To improve the mental health and well-being of children with physical disability, we should attach importance to identifying those children who experienced childhood maltreatment and providing them with appropriate help. The findings can help professionals and researchers recognize the vulnerability of children with disabilities or long-term health problems in terms of childhood maltreatment, and provide evidence for prevention programs to better protect them. Based on Chinese social context, Peng et al. (2012) advocated a system approach to address child maltreatment in China, including establishing child protection agencies, improving child protection laws and implementing three levels of prevention (i.e., primary, secondary, and tertiary). We might speculate that this system approach could also reduce maltreatment in children with disability or long-term health problems. Additionally, studies have reported that family based on interventions could lessen maltreatment in children with disabilities (Chen and Chan, 2016; Weisleder, 2011). It is deduced that family-based prevention could reduce the maltreatment of children with disability, thus, improve the mental health status of children with disability.

4.1. Limitations and future directions

The limitations of this study must be noted. First, we could not make the causal relationship due to the cross-sectional nature of this study. Second, all data were collected by self-reported. Therefore, the recalling bias is not inevitable. Longitudinal studies are needed to confirm the relationship between childhood physical disability or long-term health problems and depression, and explore the underlying mechanisms of the relationship between them. Thirdly, children who suffered from physical disability or long-term health problems might stay at home or attend special education schools, thus, missed the investigation. Future studies should include special education schools or collect data from parents, teachers, and peers.

Despite these limitations, we believe that our results provide important insights. In this study, we found that the prevalence rate of childhood physical disability and long-term health problems was 7.7%. Childhood maltreatment mediates the relationship between childhood physical disability or long-term health problems and depression among adolescents. Our finding has indicated that preventing childhood maltreatment might benefit at reducing depression in adolescents with childhood physical disability or long-term health problems. Future studies using cohort design is needed to confirm the relationship between childhood physical disability or long-term health problems and depression, and to explore the underlying mechanisms of the relationship between them aiming to provide information to help interventions improve the mental health of children and adolescents with physical disability or long-term health problems.

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Declaration of Competing Interest

The authors declare that they have no conflict of interest.

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